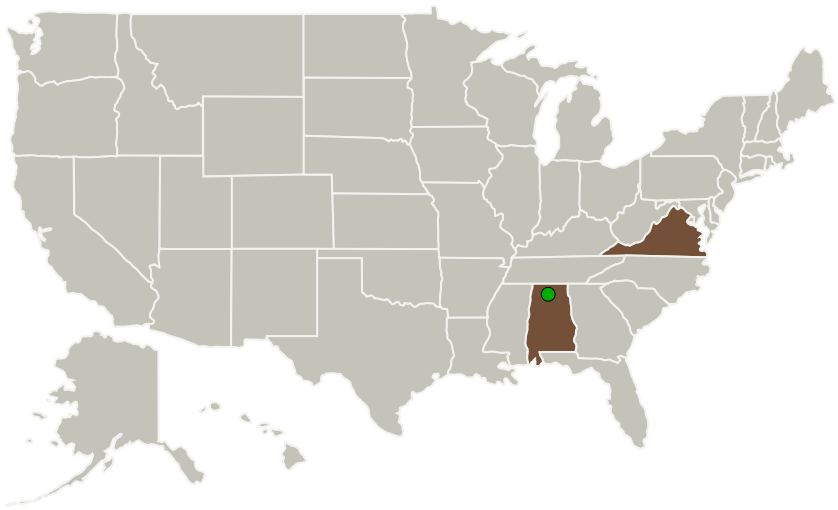
Self-Powered Magnetothermal Fluid Pump, Phase I

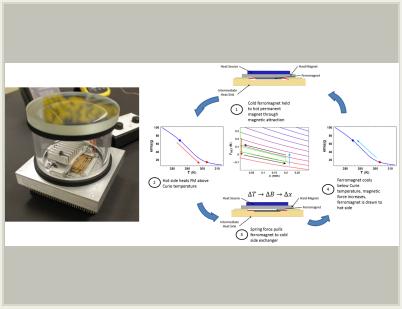
Completed Technology Project (2013 - 2013)

Project Introduction

The ability to successfully manage thermal loads is increasingly a primary design constraint for many emerging engineered systems. Systems ranging from military aircraft to computational platforms to photovoltaic (PV) power generation all generate unwanted heat and traditional methods for transporting and removing this heat are often heavy, cumbersome, power hungry, or lack adequate heat removal capacity. Excess heat can result in reduced efficiency in PV systems, limit duty cycles for pulsed power applications, and ultimately cause failure of critical components if not managed properly. Similar problematic scenarios exist for many power generation systems, high power radio frequency (RF) devices, portable electronics, and lasers, to name a few. A host of thermal management techniques are currently available including heat pipes, liquid immersion, jet impingement and sprays, thermoelectric coolers, and refrigeration. While these techniques are adequate in some cases, none of these methods alone can meet the needs of future high power thermal management without incurring large penalties of weight, power, or volume. The technology proposed here overcomes these limitations through autonomic, self-powered, and self-cooling functionality by directly converting the unwanted thermal energy into useable mechanical energy for use in coolant pumps or refrigeration compressors.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Prime Photonics, LC	Lead Organization	Industry	Blacksburg, Virginia
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Virginia

Project Transitions

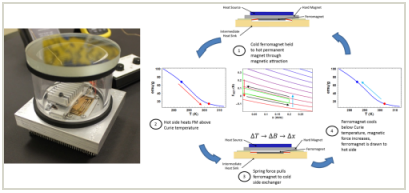
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140400)*

Images



Project Image
Self-Powered Magnetothermal Fluid Pump
(https://techport.nasa.gov/image/126557)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Prime Photonics, LC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
David Gray

Co-Investigator:
David K Gray

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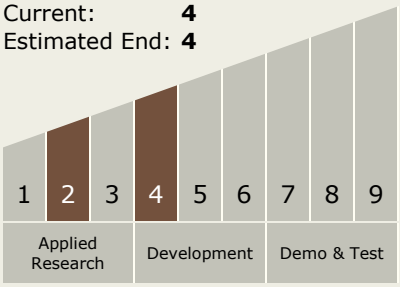
Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.2 Heat Transport

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System